



Urban Wilderness Canoe Adventures (UWCA)

Global River Futures Field Trip

Route: Picnic Island (Fort Snelling State Park) to Smith Avenue Bridge,

Saint Paul

Suggested Grade Level: 8th

Timeframe: 4½ hours

Distance: Approximately 5.0 mi. **Trip Theme:** Water quality in rivers reflects human activity and land use

in watersheds.

Key Learning Objectives:

- 1. Students will draw water samples from the Minnesota and Mississippi Rivers, and perform basic field analysis to measure contaminants in the two rivers.
- 2. Students will examine maps to identify land usage along each river's course.
- 3. Students will find connections between land use and water quality.
- 4. Students will understand the relationship between the Mississippi River water quality and the health of the planet.

Overview of Field Experience:

Students canoe from Picnic Island to the confluence of the Mississippi and Minnesota Rivers. At the confluence, students take measurements of water quality from each river. The measurements may be taken with transparency tubes (suspended solids), test strips (pH, nitrate or chloride), or hand held electronic instruments (temperature, dissolved oxygen or total dissolved solids). Students will examine Minnesota data-maps and compare land uses along the course of each of the two rivers within Minnesota. Students will also examine a data-map of the 48 contiguous states to investigate larger scale issues, such as hypoxia in the Gulf of Mexico. A ranger will lead the students in discussing the ecological significance of their findings.

The students will canoe a short distance up the Mississippi to Crosby Farm Regional Park and stop for lunch. Rest facilities are available at the park. Time permitting, students and rangers may convene and focus on additional aspects of river health such as stream flow or pulse. Following lunch, the students will paddle downstream approximately 4 miles to the Smith Avenue Bridge (Saint Paul High Bridge). Along this stretch of the river, students may observe floodplain forest habitat, the former floodplain town site of Lilydale, barge traffic, bridges, wing dams, storm outlets, and other urban infrastructure.





Minnesota Academic Standards (Science):

The field trip will either address or enable classroom involvement with the following standards (key standards in bold).

- 8.1.1.2.1 Use logical reasoning and imagination to develop descriptions, explanations, and predictions based upon evidence (Based upon local evidence, we will attempt to explain contrasting water quality in two adjacent rivers, and make predictions about how land use at a larger scale may impact water quality near the mouth of the Mississippi River.)
- 8.1.3.3.2 Understand that scientific knowledge is always changing as new technologies and information enhance observations and analysis of data. (Students will use modern technology to collect data and evaluate impacts of 150 year old drainage systems.)
- 8.1.3.4.1 Use maps, satellite images and other data sets to describe patterns and make predictions about local and global systems in Earth science contexts. (Students will examine state and national data maps to explain hypoxia in the Gulf of Mexico).
- 8.1.3.4.2 Determine and use appropriate safety procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in Earth and physical science contexts. (Wearing life preservers, students will measure water quality in two rivers. The Minnesota River represents a highly designed drainage and ditch system. The Mississippi, prior to the confluence, represents a more natural watershed system.)
- 8.2.1.1.1 Distinguish between a mixture and a pure substance... (Students will measure suspended materials and dissolved solids in river water.)
- 8.2.1.2.4 Recognize that acids are compounds whose properties include ...

- changes with litmus... (Students will measure pH of river waters.)
- 8.3.1.2.1 Explain how landforms result from the processes of ...weathering, erosion and deposition of sediment. (Students will examine suspended solids in rivers, and discuss soil erosion as related to surface run-off.)
- 8.3.1.2.2 Explain the role of weathering, erosion and glacial activity in shaping Minnesota's current landscape. (Students will paddle through a river valley formed by melt water from the most recent glacial activity in Minnesota.)
- 8.3.2.3.1 Describe the location, composition and use of major water reservoirs on the Earth, and the transfer of water among them. (Students will paddle a major water reservoir, and see waters transferred by tributary, surface run-off, and possibly groundwater seeps.)
- 8.3.2.3.2 Describe how the water cycle distributes materials and purifies water. (Students may see evidence of the water cycle, such as seeping groundwater.)
- 8.3.4.1.2 Recognize that land and water use practices in specific areas affect natural processes and that natural processes interfere and interact with human systems.

 (Students will examine land and water use within two watersheds and identify conflict between natural processes and designed systems.





Recommended Classroom Activities (Priorities in Bold):

Journaling Project

Students will make a journal in class before the trip. On the front cover, they will create a collage of their impressions of river nature or what they expect to see on the trip. Collage materials will be supplied by UWCA. The journals will then be used to take notes about their experiences on the trip. Students will be asked to answer the following open-ended question related their river impressions/experiences:

8th Grade Global River Futures: What can you do in your life to help improve the ecosystems of the Mississippi River and the future health of the planet?

The students will write their responses in their journals before the trip. Bring journals and supplies along on the trip so that students may write notes or draw pictures. They may finish their writing in a trip follow-up session in class. The intent of this journaling exercise is to allow students to "Live Inside the Questions", and to analyze what they have learned.

In a follow-up class session, students will complete the back covers of their journals by doing another collage of their post-trip impression. Students may use the materials provided by the UWCA or draw their own images.

Pre-trip Classroom Activities

- Online video module explaining the Mississippi River Dead Zone and its connection to upper Midwest agriculture: http://cgee.hamline.edu/flash/MississippiRiver/MissRiverModule.html
- Online poster for classroom discussion or display: 150 years of agricultural technology in Minnesota: http://www.mda.state.mn.us/sitecore/content/Global/MDADocs/kids/sesquitimeline.aspx

Post-trip Classroom Activities

- Watch and discuss "Big Question: Is Earth Past the Tipping Point?" video at http://www.scientificamerican.com/video.cfm?lineup=1406165298&id=725 09495001
- View the film Food, Inc. or King Corn





Detailed Route Description and Trip Activities:

Start: This trip begins at Picnic Island, within Fort Snelling State Park. Wilderness Inquiry staff will present an orientation on safety and canoeing. Principles of "Leave No Trace" are emphasized throughout the trip. Each student will be assigned to a crew and a boat. A group of three crews/boats will constitute a pod. Each boat has a captain, paddling in the stern (rear). One captain in each pod (pod leader) will provide the pod members with an overview of the route activities, and introduce the students to the concept of watershed and the confluence of the Mississippi and Minnesota Rivers. Pod leaders will explain to their students that each watershed is unique and that water quality in every river reflects human behavior and land use within each watershed.

Each boat and crew will launch into the Minnesota River and paddle approximately one mile to the tip of Pike Island, at the confluence of the Minnesota and Mississippi Rivers. One boat from each pod will collect a water sample (approx. 1000 ml) from each of the two rivers. The students will then land their boats on the tip of Pike Island. Each pod will convene on shore, and pod leaders will explain to the students about the parameter(s) of water quality that their pod will be measuring Parameters may include: pH, temperature, total suspended solids, total dissolved solids, chloride, nitrates, or dissolved oxygen.

For example, the pod leader may explain to the students that nitrates are molecules comprised of nitrogen and oxygen. Two major sources of nitrate pollution are fertilizer and coal burning power plants. Nitrates, from the air or soil, dissolve into rain water and travel to the river as surface run-off. We call this type of contamination "non-point source pollution". Nitrates damage the Gulf of Mexico because they fertilize algae and cause it to grow excessively. Later, when the great amount of algae dies, it is decomposed by bacteria. The bacteria multiply and consume nearly all of the dissolved oxygen from the water, leaving nothing for fish or other aquatic animals. We call this condition "hypoxia". The hypoxia in the Gulf of Mexico covers thousands of square miles of ocean, and we call this the "Dead Zone". Nothing lives there.

Volunteer students from each pod will perform the analysis on one sample of water from each river. The student analysts shall present the results to the pod, and the pod leader will guide the students in a discussion to compare and interpret the results from the two rivers. Pod leaders may briefly discuss the difference between point source and non-point source pollution in water. Urban run-off, agricultural run-off, and aquatic deposition of airborne contaminants are all considered non-point source pollution.





Next, the students will have an opportunity to examine data maps of various land uses along each river. The students should notice that each of the two rivers has some urban development within its watershed. However, the Minnesota River flows through counties with significantly more agricultural activity, particularly corn and soybean production. The student should be able to determine if the contamination they are detecting is more likely to be point-source or non-point source, and its likely origins.

Lunch: Upon completion of water analysis, the students will re-launch and paddle upstream a short distance to Crosby Farm Regional Park to stop for lunch. Restrooms are available. During the break, a National Park Service ranger will discuss how water quality affects global ecosystems and what students can do to help. The students will break into smaller groups for discussion.

Following lunch, students will re-launch and paddle four miles downstream to our final destination near the base of the Smith Avenue Bridge. Along this stretch of the river students will paddle past floodplain forest habitat, the former floodplain town site of Lilydale, barge traffic, bridges, wing dams, storm outlets, and other urban infrastructure. Boat captains will guide discussions about urban structures and their impacts upon the river.

Finish: After each crew has been unloaded its canoe, the entire group of students will assemble in a large circle for a trip wrap-up discussion. One member from each pod will report the results of their water analysis for each river, to the entire assembly. As each test result is reported students will have a final opportunity to compare the water quality characteristics of the agriculturally dominated Minnesota River watersheds with the pre-confluence watershed of the Mississippi River.

Buses will pick up groups at this landing site at the designated times. If personal vehicles have been left at the launch site, teachers will have to make special arrangements to pick them up.